

- ☒ fossil energy
- ☐ environmental
- ☐ energy efficiency
- ☐ other

SULFUR REMOVAL FROM LOW-QUALITY NATURAL GAS

States Impacted:

Colorado, Louisiana, New Mexico, Oklahoma, Texas

Benefit Areas:

Low Quality Gas Utilization,
Increased Gas Supply

Participants:

Membrane Technology and Research, Inc., Shell Exploration and Production Co.

FETC Contact:

Anthony Zammerilli**

Office: (304) 285-4641

E-Mail: azamme@fetc.doe.gov

MAIL ADDRESS:

* U.S. Department of Energy
P.O. Box 10940
626 Cochran's Mill Road
Pittsburgh, PA 15236-0940

**U.S. Department of Energy
P.O. Box 880
3610 Collins Ferry Road
Morgantown, WV 26507-0880

WEBSITE:

www.fetc.doe.gov

Description

A significant fraction of U.S. natural gas reserves is subquality because of the presence of excessive carbon dioxide, hydrogen sulfide, or nitrogen gas. For natural gas to be useful as fuel and feedstock, hydrogen sulfide has to be removed to the environmental pipeline specification of 4 ppm. The technology used to achieve this specification has involved absorption using amine or a similar chemical or physical solvent. Although mature and widely used in the gas industry, absorption processes are capital- and energy-intensive and require constant supervision for proper operation. This makes these processes unsuitable for treating gas at low throughput, in remote locations, or with a high concentration of acid gases.

During this project, high-performance polymeric thin-film composite membranes were brought from the research stage to field testing. The membranes have hydrogen sulfide/methane selectivities in the 35 to 60 range, depending on feed conditions, and have been scaled up to commercial-scale production size. A large number of spiral-wound modules were manufactured, tested, and optimized during this project, which culminated in a field test at a Shell facility in East Texas. The gas treated contained approximately 3 percent hydrogen sulfide, 12 percent nitrogen, 75 percent methane, and 10 percent higher hydrocarbons.

Goals

The objective of the project is to develop a novel/advanced technology for the economical removal and recovery or disposal of sulfur from sulfur-contaminated natural gas in an environmentally acceptable manner.

Tangible Benefits

National: This project is part of a suite of advanced technologies and projects under DOE sponsorship that are helping ensure an adequate supply of domestic natural gas. Exploitation of smaller, lower quality resources will be necessary to meet demand as the large gas fields in the U.S. are depleted. About 13 percent of existing natural gas reserves, or 19 trillion cubic feet (Tcf) may be contaminated with hydrogen sulfide. The field test in East Texas showed that membrane module performance on an actual natural gas stream was close to that observed in the laboratory tests with cleaner streams. Economic analyses indicate that polymeric film membrane used in conjunction with an adsorption finishing process can provide a cost savings of 20 to 40 percent over stand-alone absorption technologies.

Regional: This technology could be used on any subquality natural gas reserve that has excessive carbon dioxide, hydrogen sulfide, or nitrogen gas. The technology is particularly useful for small independent producers with gas processing plants.